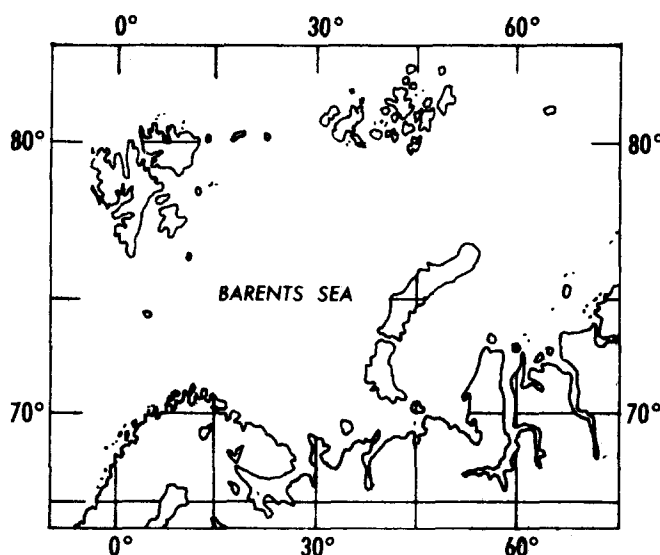


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INFORMAL REPORT

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I. INTRODUCTION

An oceanographic survey was conducted in the Barents Sea by the Naval Oceanographic Office (NAVOCEANO) aboard USS TANNER (AGS 15) from 20 July to 31 August 1963. This report presents only the results of the analyses of 44 plankton samples obtained on the survey.

A. Physical Environment.

The Barents Sea lies entirely within the Arctic Circle. The sea is delimited to the west from the Norwegian Sea by an imaginary line from North Cape, Norway, northward to Bear Island and Spitzbergen, to the north on a line from Spitzbergen to Franz Josef Land, to the east by Novaya Zemlya, and to the south by Norway and the U.S.S.R. Average depth in the Barents Sea is 220 meters, and a maximum depth of only about 600 meters occurs near the boundary of the Norwegian Sea.

Interesting oceanography results from the interaction of converging Atlantic and Arctic Waters in the Barents Sea (Fig. 1). The currents within the sea form a counterclockwise movement with a number of gyres in the central part (Demel and Rutkowitz, 1966). Atlantic waters enter the Barents Sea between Bear Island and North Cape as the North Cape Current. This current, a branch of the Gulf Stream, is deflected northeasterly as the Murman Current which moves warm, relatively high salinity water northeastward along the coast of Novaya Zemlya.

Arctic waters enter the Barents Sea mainly in the East Spitzbergen Current, which flows southwestward between Spitzbergen and Franz Josef Land, and in the Bear Island Current, which flows westward between Franz Josef Land and Novaya Zemlya. These currents move cold, relatively low salinity water.

The mixing of warm Atlantic waters with colder Arctic waters results in a nutrient enrichment and a high oxygen content throughout much of the Barents Sea.

In winter, ice covers only two-thirds of the Barents Sea; the southern part is relatively ice free except in isolated fiords along the Norwegian coast. In summer, ice mostly thaws, and only in the coldest years does it persist in the middle and northern parts of the sea and near Novaya Zemlya. The climate of the Barents Sea, as elsewhere in the Arctic, has recently shown a warming trend. The result is an extension of distribution ranges of many Atlantic marine organisms into the Barents Sea (Fig. 2).

B. Results of Previous Investigations.

Russian biologists have studied the biology of the Barents Sea for at least 30 years. Zenkovich (1963) found that the extreme annual

temperature range in the sea results in a marked seasonal variation in the plankton volume. In winter, the zooplankton and phytoplankton biomass in the surface layers is less than 20 mg/m^3 . In spring, near the ice floes, the biomass concentrations may exceed $2,000 \text{ mg/m}^3$, and in summer, the biomass averages about $1,000 \text{ mg/m}^3$.

Demel and Rutkowicz (1966) state that vertical migration of zooplankton to the surface in the Barents Sea, particularly crustaceans, ceases during the prolonged daylight of the Arctic summer. During summer, the plankton are concentrated at a depth of about 150 meters, and surface bioluminescence, as a result, is a minor consideration. During September and October, with the seasonal resumption of alternating 12-hour periods of daylight and darkness, the plankton resume a daily migration to the surface. Surface bioluminescence periodically may be important, therefore, in autumn, winter, and spring. Although winter plankton biomass is considerably less than summer biomass, there are undoubtedly times when surface bioluminescence is significant in winter.

II. METHODS OF COLLECTION AND ANALYSIS

Plankton hauls were attempted at 46 station locations in the Barents Sea, and plankton samples were obtained at 44 of the stations (samples from stations 10 and 30 were lost) (Fig. 3). Of the 44 plankton sample volumes obtained, 36 samples were taken with a #8 mesh, 1-foot diameter net, seven samples with a #5 mesh, 1/2-meter diameter net, and one sample with a #10 mesh, 1/2-meter diameter net. Forty-three samples were taken by horizontal tows at depths ranging from the surface to 350 meters with an approximate average depth of 150 meters. One sample was obtained by a vertical haul from 57 meters. The durations of the tows were 30 minutes for 41 tows and one tow each for 5, 37, and 44 minutes. In addition, a white secchi disc was lowered at most stations to obtain visibility data. All operations were performed as the ship drifted on station.

The net was not weighted, and no method was available for opening or closing the net. Therefore, varying amounts of plankton probably entered the net as it was lowered to the selected depth and as it was raised to the surface.

Since no attempt was made to determine the volume of water passing through the net or the velocities of wind and current, a quantitative statement cannot be made. However, assuming that a constant drift prevailed in the Barents Sea and by correcting, where necessary, for the durations of the tows and for the net ring diameters, the data appear appropriate as an index of relative abundance of the various plankton groups.

In the laboratory, each plankton sample was measured by the volumetric displacement method. The drained plankton sample was placed in a

graduated cylinder, and water was added to bring the total to 100 cc. The drop in the water column on removal of the sample from the cylinder indicated the volume of the sample. In samples containing 1 cc or less of plankton, all specimens were counted. Samples having a greater volume of plankton than could be conveniently counted were separated into aliquots by means of a Folsom plankton splitter. The largest specimens were removed before the sample was split. The constituents of the split were counted and identified using a 35-power microscope. From these counts, an estimate was made of the total number of each type of plankton in the entire sample.

III. PLANKTON ANALYSIS

Analyses of the plankton samples indicate at least three groups of well-defined plankton associations in the Barents Sea that are apparently related to the point of origin. Each group had characteristic organisms although some species were obtained throughout the sea. The three assemblages consisted of the following: (1) a group of organisms in the central portion of the Barents Sea which forms a semi-permanent population; (2) a group of southern affinities which is carried regularly into the sea with the North Cape Current; and (3) a group of Arctic forms which enters the northern portion of the sea with water masses between Spitzbergen and Franz Josef Land. The distribution of several indicator species in each water mass delineates to a certain extent the course and boundaries of the water masses, and the eddies between the major currents sometimes contain the largest volume of plankton. These eddies act as effective barriers which limit the distribution of indicator species from one water mass to another.

During summer in the Barents Sea, plankton are concentrated at approximately 150 meters (Demel and Rutkowitz, 1966). Figure 4 shows the temperature distribution at 150 meters as observed during this survey. Surface temperature and salinity are contoured in Figures 5 and 6, respectively. Plankton wet volume in cubic centimeters and the depth of collection in meters for each sample are shown in Figure 7. A station data summary is presented in Table I. The estimated numbers of plankton taxa at each station are listed in Table II.

Horizontal distributions of the most numerous or interesting species are presented in Figures 8 through 40. The large numerical differences in plankton counts between the almost identical locations of stations 1 and 20 occur because these stations were taken 31 days apart.

A. Protozoa.

Ceratium sp., a bioluminescent dinoflagellate, ranged in small numbers throughout most of the Barents Sea with areas of relatively high concentrations at the most northeasterly, southeasterly, and southwesterly stations. This form was most abundant above 115 meters and is considered mainly a surface species (Fig. 8).

Another bioluminescent (noflagellate, Peridinium sp., apparently of Arctic origin, was found at two stations only. Demel and Rutkowicz (1966) state that nocturnal bioluminescence in the Barents Sea is produced in part by bacteria and dinoflagellates.

Foraminifera (Globigerina sp.) also seemed to be an indicator of Arctic Water (Fig. 9). This form occurred in great numbers only in the northeast sector of the sea. Radiolaria were collected at a few stations, the greatest number being observed at station 23 near the Norwegian coast.

B. Coelenterata.

Jellyfishes were obvious indicators of Atlantic Water and were virtually confined to the North Cape Current where surface salinity exceeded 34 o/oo and surface temperatures ranged between 3° and 9°C (Fig. 10). No attempt was made to sort all the jellyfishes to species, but the following were identified: Aglantha digitale, seemingly the most numerous, and Halopsis ocelata, second in order of abundance. Also present were Ptychogene lactea and Euphysa flammea. Jellyfishes in the Barents Sea are known to be a source of bioluminescence (Demel and Rutkowicz, 1966).

The abundance of Siphonophora was determined by a nectophore count. Siphonophora were widely distributed and most numerous near the confluence of Arctic and Atlantic Waters (Spitzbergen and North Cape Currents) where they were perhaps a permanent part of the seasonal fauna of the central sea (Fig. 11). Dinophys arctica was the only species recognized although several more species likely occurred.

C. Chaetognatha.

Chaetognatha (arrow worms) are recognized as indicator species of water masses in some parts of the world. Two species of this phylum formed about 0.1 percent of the plankton. Eukrohnia hamata, a species of worldwide distribution, was transported into the Barents Sea in the tongue of 35 o/oo salinity water which forms the North Cape Current. Its numbers decreased rapidly from the southwest approaches to the central portion of the sea (Fig. 12). The other species, Sagitta elegans, was less numerous and in contrast ranged in a northwestward direction across the central portion of the sea from a concentration west of Kolguyev Island on the Russian coast (Fig. 13). Arrow worms formed about 0.25 percent of the total plankton.

D. Annelida.

Polychaete worms were numerous at stations in the southwestern approaches to the Barents Sea at surface temperatures near 9°C (Fig. 14). Among the forms collected were spionid larvae and Tomopteris helgolandica.

The latter species appears to have been carried into the Barents Sea from the Atlantic Ocean and was scarce and limited to the central portion of the sea.

E. Arthropoda.

Crustaceans normally compose 80 to 90 percent of marine plankton by volume and outnumber all other groups in variety of species. They are the chief source of scintillating bioluminescence, and certain of the copepods and euphausiids that occur in large numbers are capable of generating significant surface illumination.

In most oceans, copepod crustaceans usually comprise the major portion of the zooplankton in volume, in total individuals, and in numbers of species. The variety of copepods decreases northward toward the pole. During the summer, the volume of copepod biomass tends to reach a maximum in polar seas. Many temperate and tropical species of copepods, like numerous other plankters, are negatively phototropic; i.e., they tend to avoid strong daylight by remaining at 150- to 200-meters depth during daylight hours and by rising to near the surface during hours of darkness. Thus, these copepods tend to form a layer of some definite thickness which undergoes a diurnal migration. Likewise, boreal and Arctic copepods and other plankton display the same negative phototropism by adjusting the frequency of their diurnal migration to the varying length of the Arctic day.

1. Copepoda. Calanus finmarchicus was the most numerous copepod in the Barents Sea and composed about 42 percent of all the Copepoda collected. This species, the main food item of young herring which follow it into the Barents Sea in the North Cape Current, sometimes occurs in dense swarms that tint the sea red. At station 8 (temperature about 2°C) at 150 meters, about 266,000 specimens of C. finmarchicus made up most of the 150 cc of plankton taken at this station (Fig. 15) which was the largest individual plankton collection.

Oithona similis was the second most abundant copepod and comprised about 25 percent of the Copepoda. O. similis was concentrated in the eddy formed northwest of the Murman Current (Fig. 16). This species apparently has established itself in this part of the Barents Sea and is augmented by an influx of additional recruits from the Norwegian Sea.

Metridia spp. composed 9 percent of the Copepoda collected. M. longa was the principal species identified. This form was most numerous in the current eddies of the central portion of the sea and in temperatures below 3°C (Fig. 17). It appeared to form a disjunct population in the central Barents Sea with little replacement from incoming currents. M. longa emits a flash of blue light so intense when disturbed that it easily can be seen in full daylight.

Microcalanus pygmaeus (Fig. 18), considered an Arctic species, was collected at 42 of the 44 stations and constituted about 6 percent of all the Copepoda.

Pseudocalanus minutus, another Arctic species, reached maximum numbers in the convection currents of the polar front west of Novaya Zemlya at temperatures below 0°C (Fig. 19). This species composed about 5 percent of the Copepoda and was collected at all but four of the stations.

Oncaea sp. also composed about 5 percent of the Copepoda collected. The species occupied an isolated position in a major gyre between the Bear Island and Murman Currents where water temperatures were between -2° and 1°C and water depth was 330 meters (Fig. 20). Oncaea is a bioluminescent genus.

Copepod nauplii (earliest stage of larvae) made up about 4 percent of all Copepoda species in these collections. The nauplii were most numerous in the convergence between the North Cape and Spitzbergen Currents (Fig. 21).

Paraeuchaeta norvegica, totaling about 0.5 percent of the Copepoda, spread across much of the Barents Sea. The main concentration was at station 16 in the northwestern part of the sea (Fig. 22).

Calanus hyperboreus composed about 0.2 percent of the Copepoda and was collected at 38 stations. Transport of this species is indicated from the northeast in the Bear Island Current. C. hyperboreus was most numerous at station 40 where temperatures varied between 8°C at the surface and 0.74°C at 145 meters (Fig. 23).

Temora stylifera, a species preferring the shallow waters of bays and estuaries, was collected only at one location (station 42) off the Russian coast at depths of not more than 45 meters (Fig. 24). This genus made up only a trace of the total Copepoda.

Microsetella norvegica was scattered in small numbers and evidently was carried into the Barents Sea from the Norwegian Sea (Fig. 25).

Tisbe sp. was present in small amounts (Fig. 26). This form was most numerous at station 31 in the north and at station 24 in the south.

Scolicithricella minor (Fig. 27) was widely distributed in small numbers throughout the sea and was most numerous in the northern and southern portions. There is evidence that this species enters the sea in the tongue of the high salinity Atlantic Water introduced by the North Cape Current.

Gaidius tenuispinus (Fig. 28) is an Arctic species which may be

carried into the Barents Sea by the Spitzbergen Current. It appeared sporadically throughout the sea. G. tenuispinus was most numerous near the central portion in the convergence between Arctic and Atlantic Waters.

Three additional species of copepods occurred in trace amounts. Pleuromamma robusta, an Atlantic species, occurred at station 21 in the southwest approaches to the Barents Sea. Heterorhabdis norvegica, a boreal and polar form, was collected at five stations in the central portion of the sea. A single specimen of Xanthocalanus borealis was collected at a northern station.

2. Cirripedia. Balanus sp. (barnacle) larvae were concentrated in the vicinity of Bear and Hope Islands. Somewhat surprisingly, these larvae also were collected at several stations in the gyres of the central portion as far as 900 miles offshore (Fig. 29).

3. Ostracoda. The ostracod Conchecia elegans appeared to have been transported from the Arctic Ocean by the Bear Island Current. This species was most abundant at the east-central stations (Fig. 30).

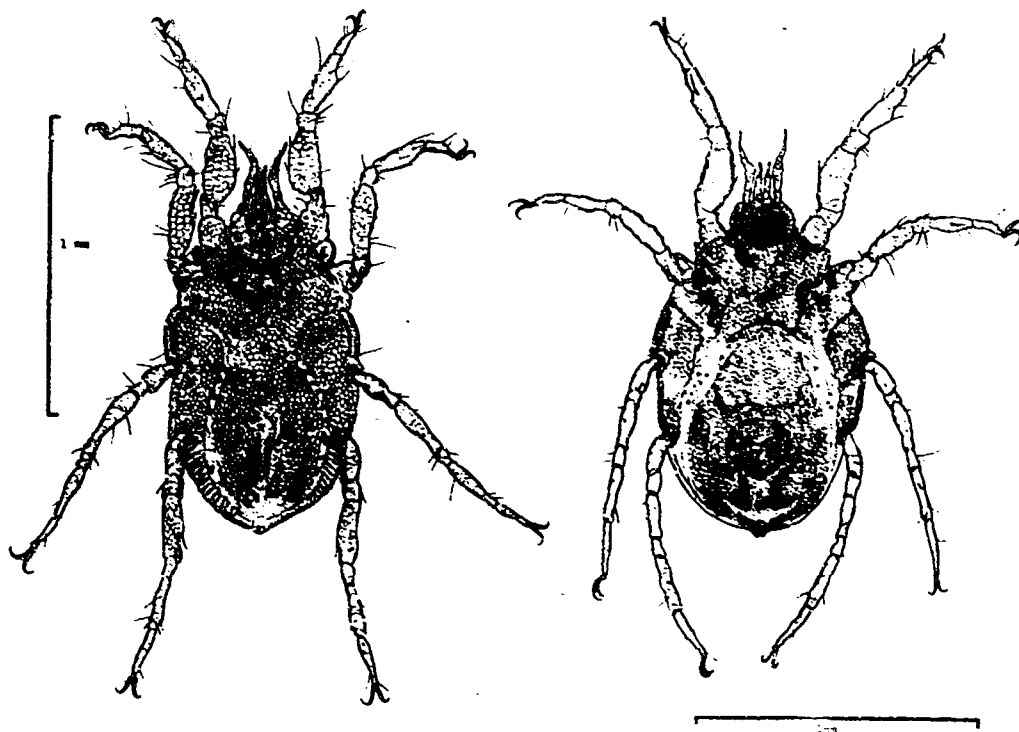
4. Euphausiacea. Euphausiids (krill) apparently were carried into the southwestern portion of the Barents Sea in the high salinity water of the North Cape Current (Fig. 31). Most of the species of Euphausiacea are bioluminescent and form the chief food of several species of baleen whales. The euphausiids composed about 0.15 percent of the crustaceans in this collection. The following species of Euphausiacea were identified from the plankton samples: Thysanoessa neglecta, Thysanoessa longicauda, Meganyctiphanes norvegica, and Rhoda inermis. M. norvegica is highly bioluminescent at the surface during polar night (Demel and Rutkowitz, 1966).

5. Amphipoda. Amphipoda (Fig. 32), present at 35 stations, reached maximum concentrations in the eddies between the North Cape and Murman Currents, the Bear Island and East Spitzbergen Currents, and the East Spitzbergen and North Cape Currents. Parathemisto was the dominant genus and was represented by at least two species: P. libellula and P. abyssorum. Hyperoche medusorum also was found. Some of the species seem to be of Arctic origin.

6. Decapoda. Decapod crustacean larvae were found in the southwestern part of the Barents Sea (Fig. 33). Caridea (Sabinea septemcarinata) and Anomura (Pagurus bernhardus) were identified in the collection as well as a megalops stage of a Brachyuran. These forms were present only in trace amounts.

7. Acarina. Two species of benthic mites were collected at three stations in the northwestern portion of the Barents Sea (stations 3, 4, and 5, Figure 34). One of the species was identified as Copidognathus thalassaracna, and the other species proved to be a species of Copidognathus new to science.

Because of the complexity of the genus Copidognathus and the great number of species, I. M. Newell estimates 1,000 (personal communication), the description of this species will be deferred until time permits a more careful study of the specimens. The drawings below, hopefully, will suffice to show diagnostic characteristics by which the species may be recognized in the meantime. The name Copidognathus spenceri will be submitted for this species, named for Dr. Warren P. Spencer, emeritus professor of biology at the College of Wooster (Ohio).



Copidognathus spenceri,
(new species, male)

Copidognathus spenceri,
(new species, female)

Type specimens of this new mite are retained in the reference collection at NAVOCEANO.

F. Mollusca.

Mollusca, mostly pteropods, made up about 5 percent of the plankton. Lamellibranchiata (bivalves) larvae were collected at five stations, being most numerous at stations 15 and 20 (Fig. 35). The boreal pteropod Clione limacina, transported from the Norwegian Sea, was collected at most of the stations. This species was most numerous in the southwestern approaches to the Barents Sea (Fig. 36). The larvae of the coiled pteropod Limacina sp. were present in large numbers in the major eddy west of the Murman Current (Fig. 37).

G. Echinodermata.

Larval echinoderms, mainly young sea stars (Asteroidea), were numerous in the Atlantic approaches to the Barents Sea. Echinoderm larvae showed an affinity for a salinity of 35 o/oo. The limit of their range extended across the southern portion of the sea (Fig. 38). These forms composed about 0.35 percent of the plankters collected.

H. Chordata.

Larvacea, represented by Oikopleura, were most abundant at the most southeastern, southwestern, and northern stations in the Barents Sea (Fig. 39). These forms are bioluminescent.

Fish larvae were collected at 5 stations. The largest concentration was 30 immature pleuronectids (flat fish) at station 43 (Fig. 40).

IV. SUMMARY

The analyses of the plankton collections indicate that certain species appear to have somewhat isolated populations in the Barents Sea. Other species are of Atlantic origin, transported by the North Cape Current, and of Arctic origin, transported by the East Spitzbergen and Bear Island Currents. The following plankton appear to fit into the respective groups:

<u>Isolated</u> <u>Populations</u>	<u>Atlantic Origin</u>	<u>Arctic Origin</u>
<u>Siphonophora</u>	<u>All jellyfish</u>	<u>Peridinium sp.</u>
<u>Oithona similis</u>	<u>Tomopteris helgolandica</u>	<u>Globigerina sp.</u>
<u>Metridia sp.</u>	<u>Calanus finmarchicus</u>	<u>Microcalanus pygmaeus</u>
	<u>Scolicithricella minor</u>	<u>Pseudocalanus minutus</u>
	<u>Eukrohnia hamata</u>	<u>Calanus hyperboreus</u>
	<u>Pleuromamma robusta</u>	<u>Gaidius tenuispinus</u>
	<u>Euphausiacea</u>	<u>Heterorhabdis norvegica</u>
		<u>Conchecia elegans</u>

A new species of benthic mite was collected on this survey in the Barents Sea. The name Copidognathus spenceri will be submitted for this species.

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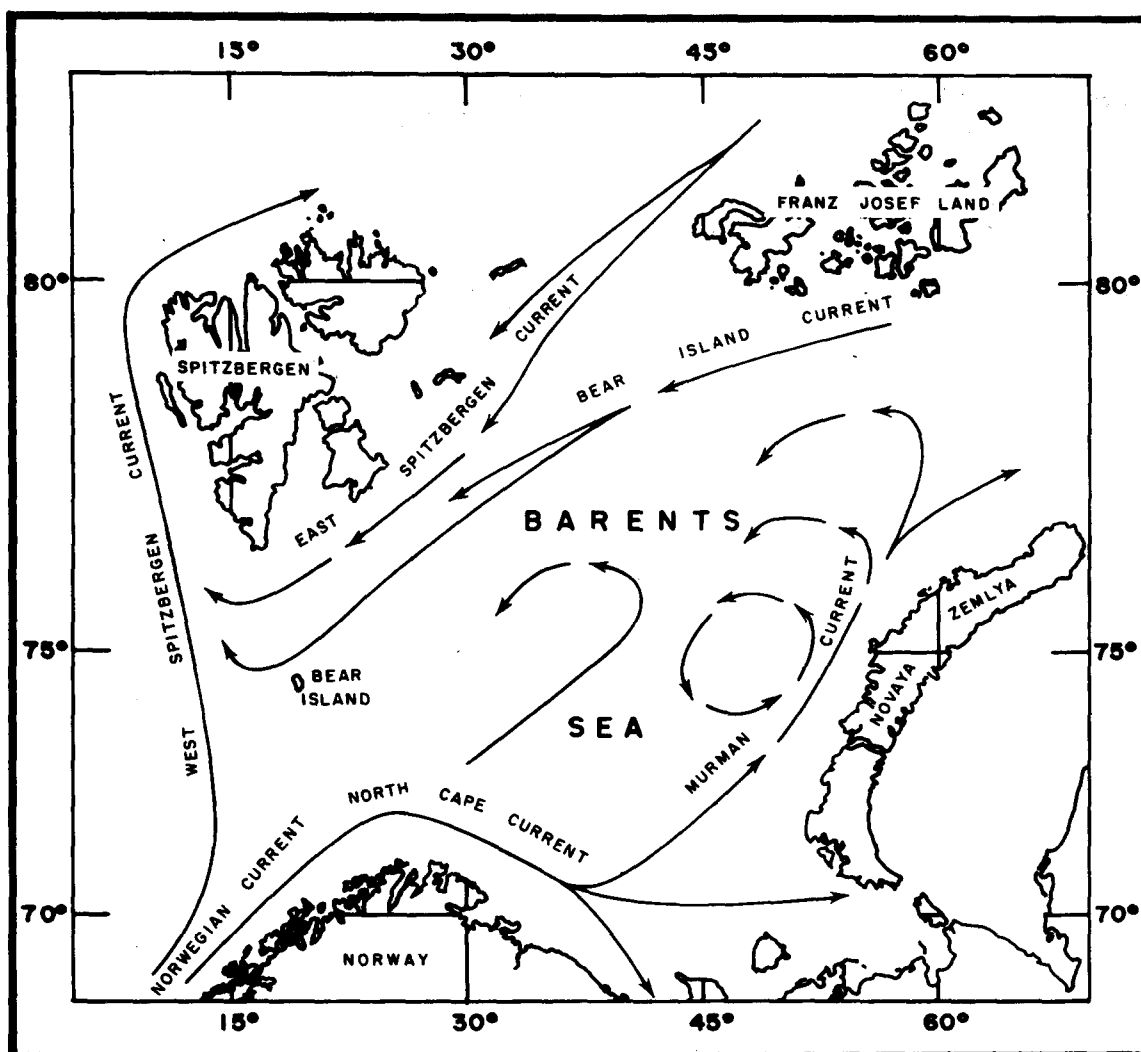


Figure 1. Major Currents in the Barents Sea

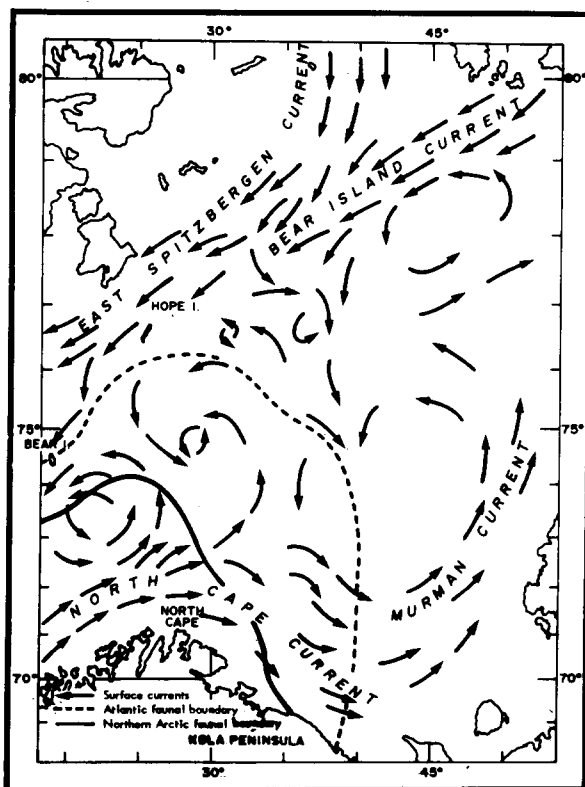


Figure 2. Boundaries of Atlantic and Northern Arctic Fauna

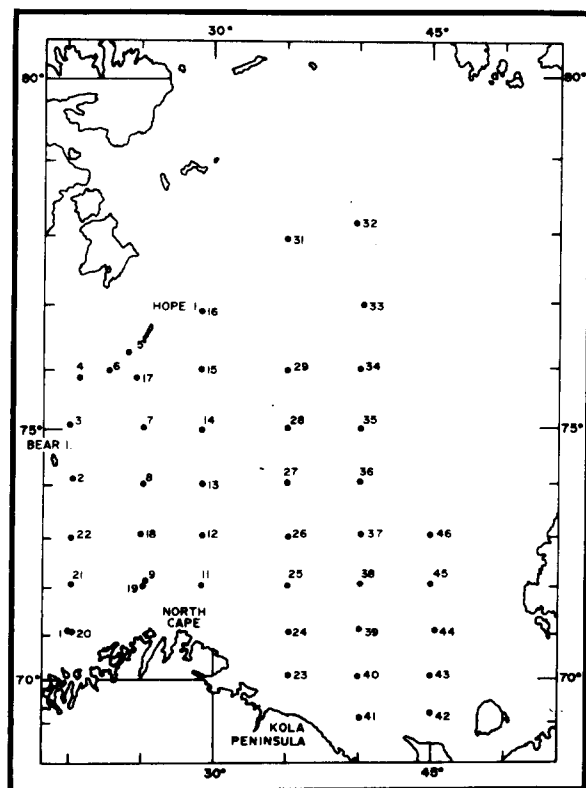


Figure 3. Station Locations

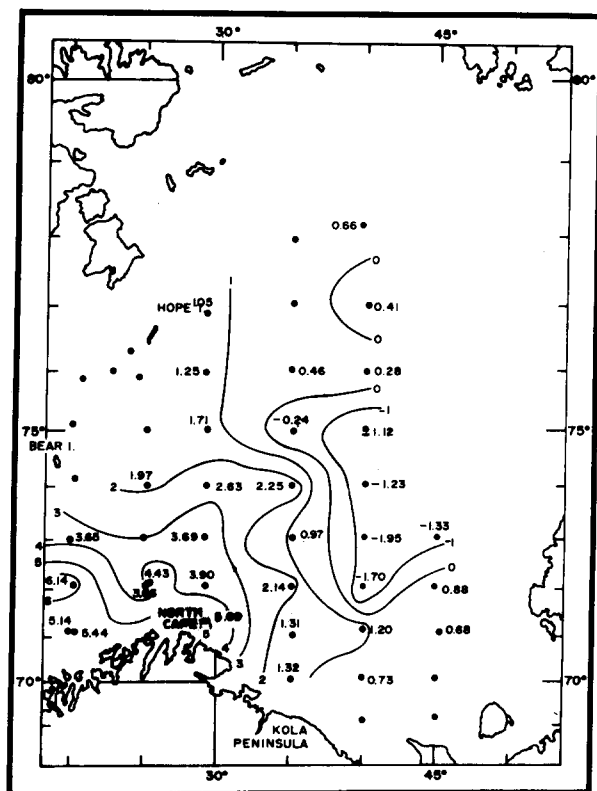


Figure 4. Temperature Distribution ($^{\circ}\text{C}$) at 150 Meters

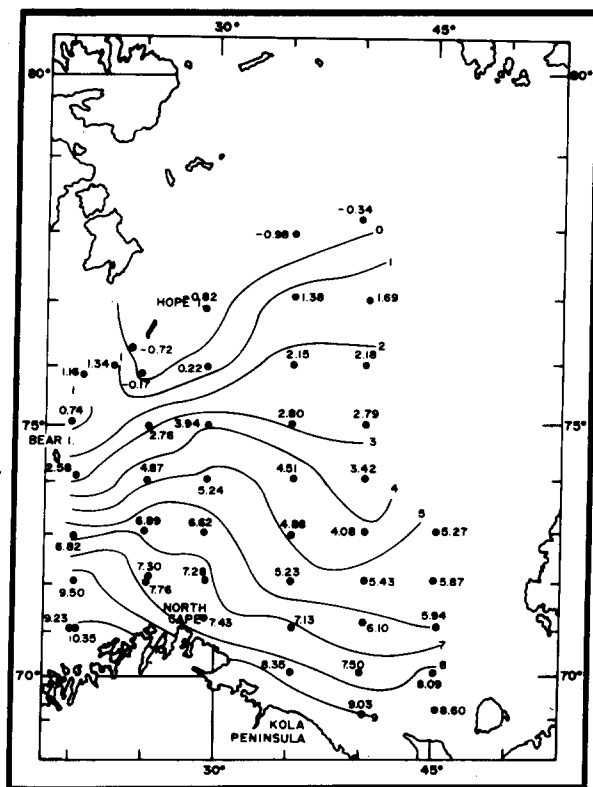


Figure 5. Temperature Distribution ($^{\circ}\text{C}$) at Surface

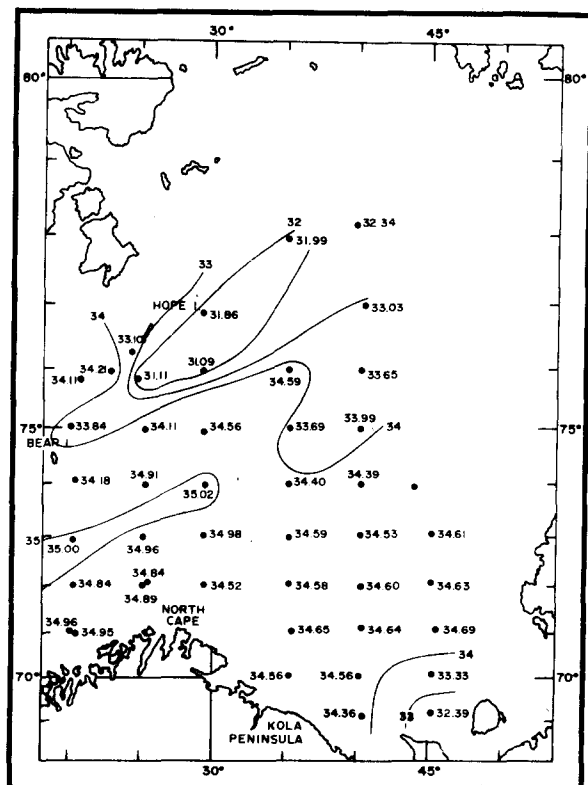


Figure 6. Salinity Distribution (‰) at Surface

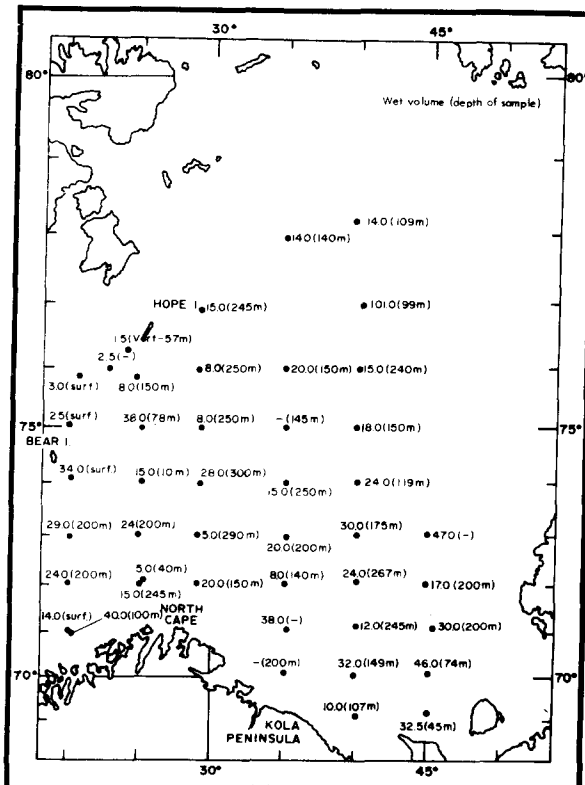


Figure 7. Plankton Wet Volume and Depth of Collection

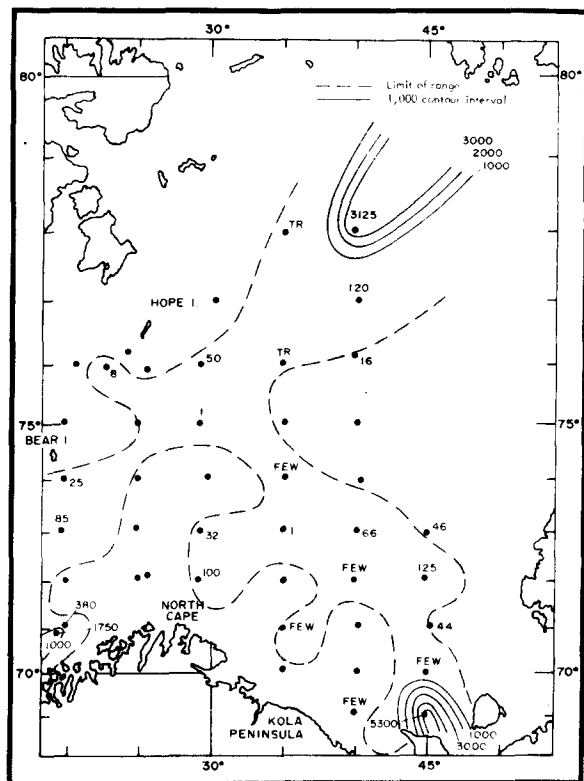


Figure 8. *Ceratium* sp.

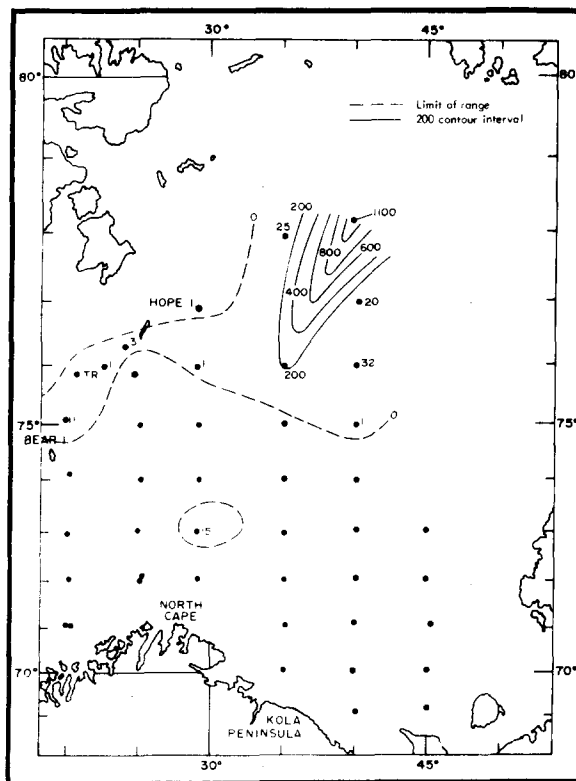


Figure 9. *Globigerina* sp.

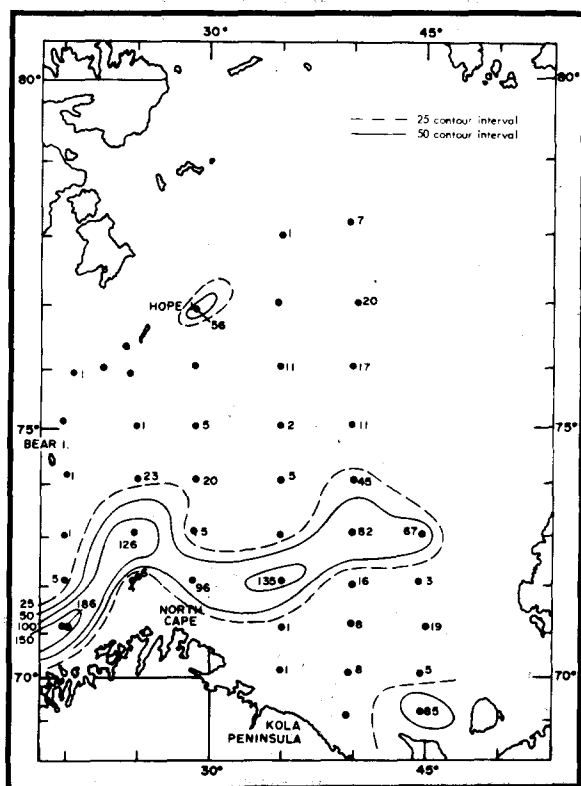


Figure 10. Coelenterata Medusae

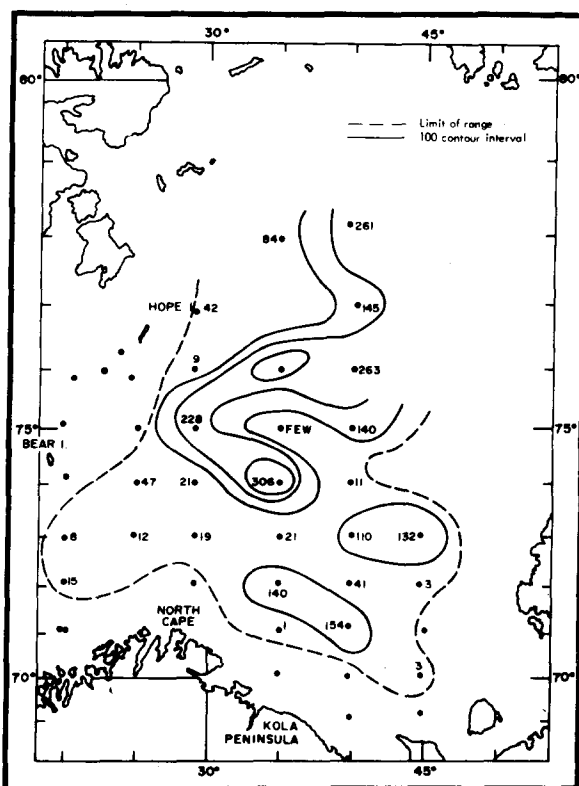


Figure 11. Siphonophora

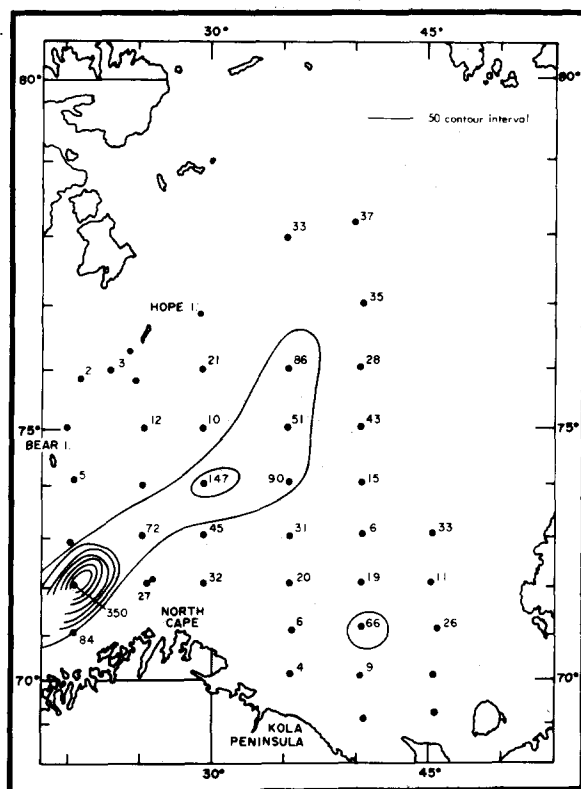


Figure 12. *Eukrohnia hamata*

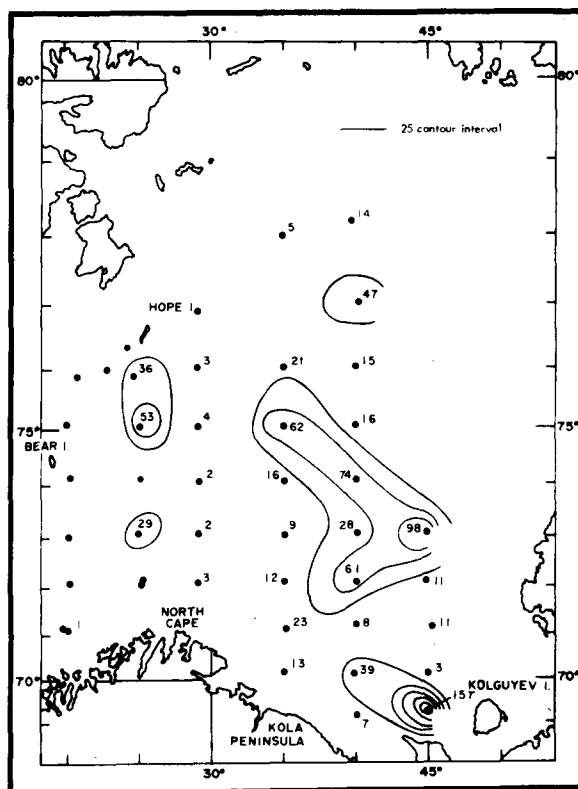


Figure 13. *Sagitta elegans*

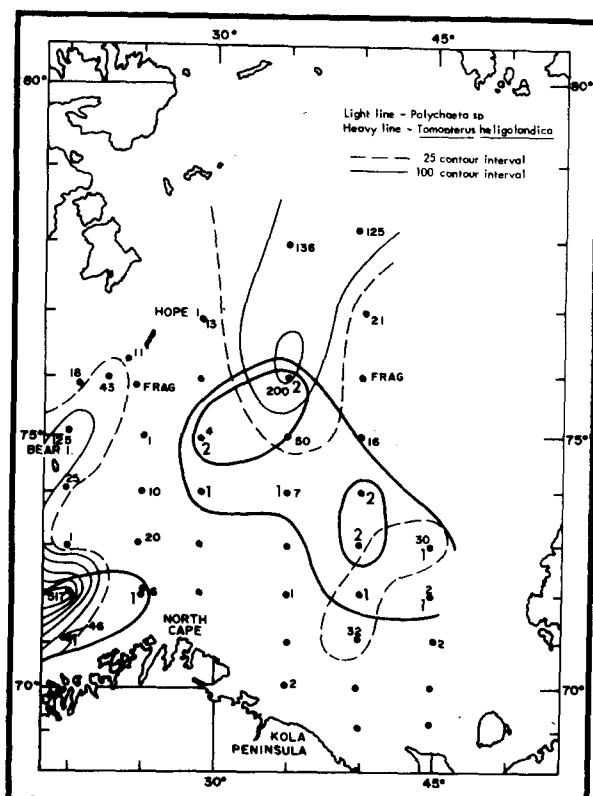


Figure 14. *Polychaeta* sp. and *Tomopteris helgolandica*

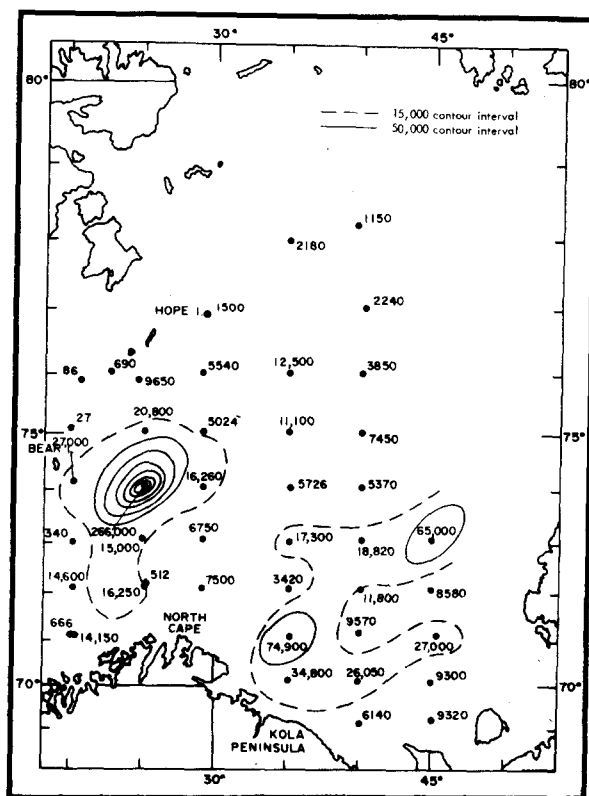


Figure 15. *Calanus finmarchicus*

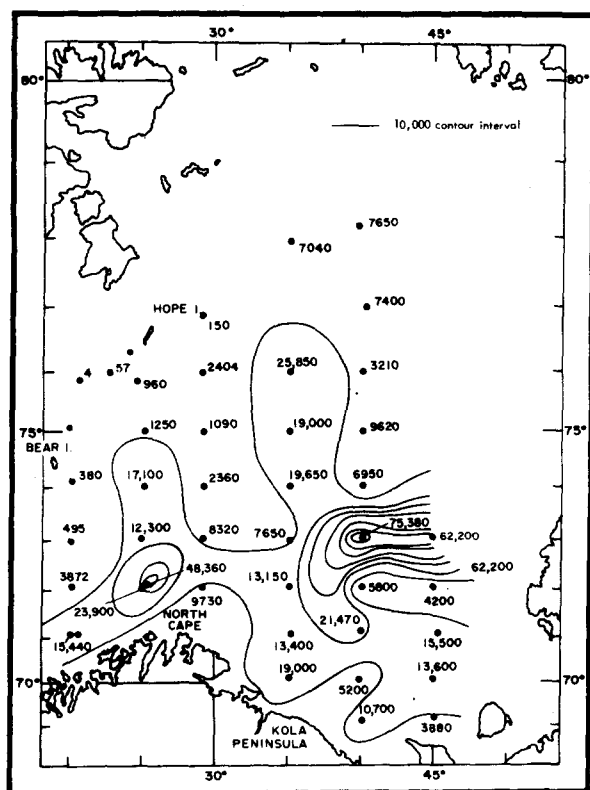


Figure 16. *Oithona similis*

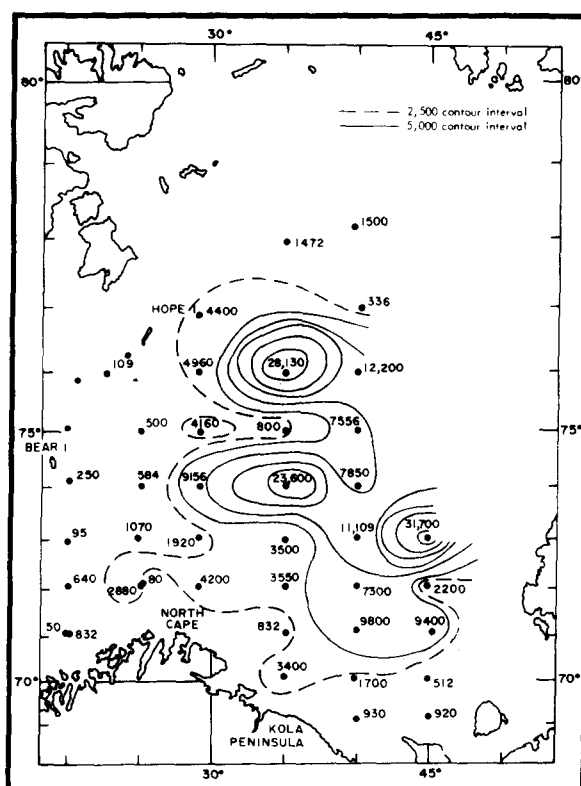


Figure 17. *Metridia* spp.

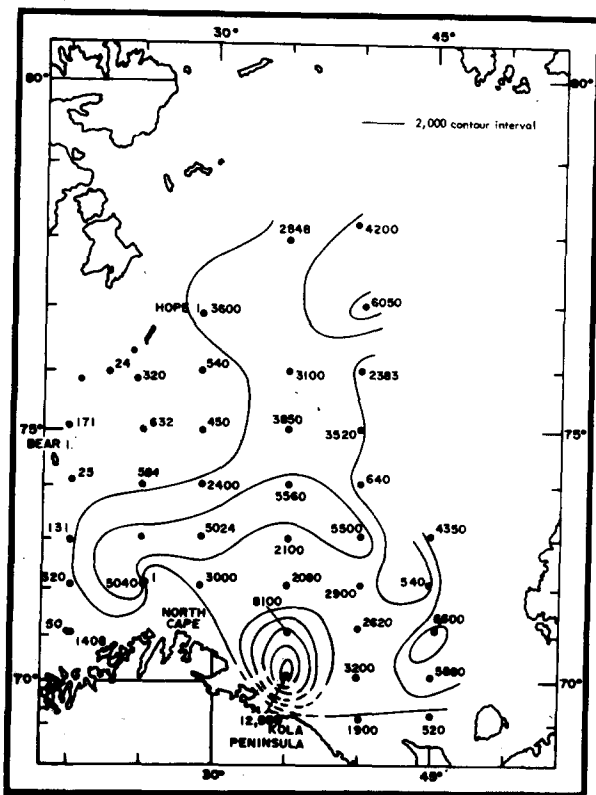


Figure 18. *Microcalanus pygmaeus*

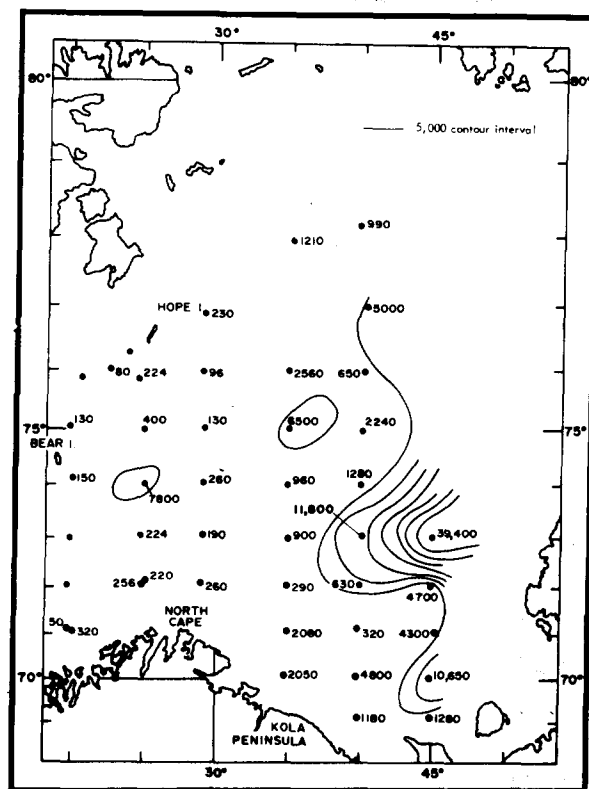


Figure 19. *Pseudocalanus minutus*

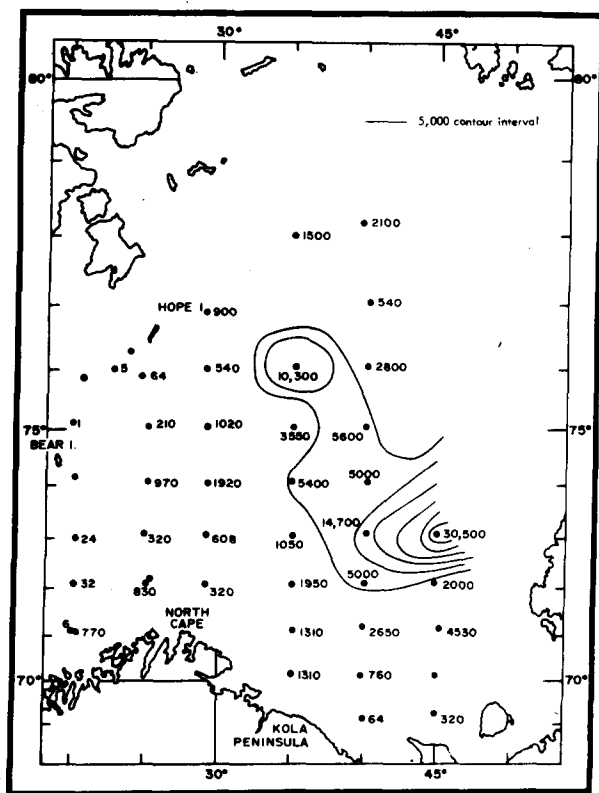


Figure 20. *Oncaea* sp.

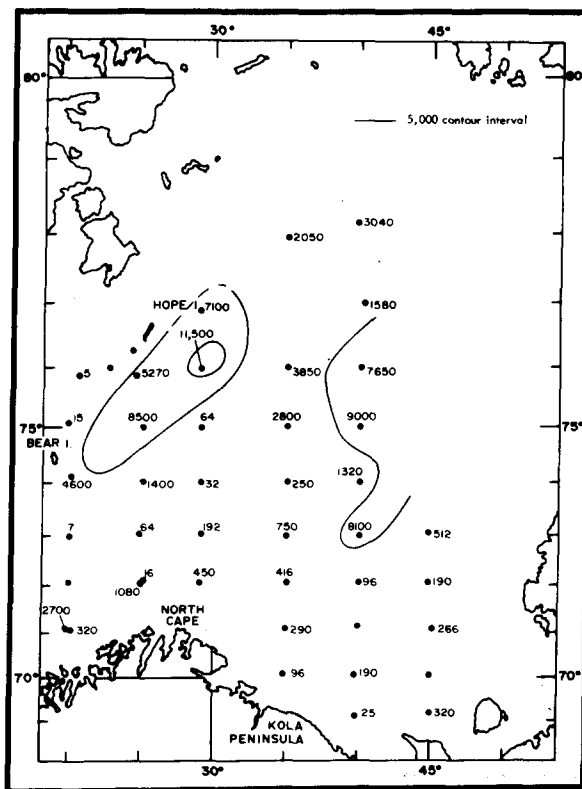


Figure 21. Copopod Nauplii

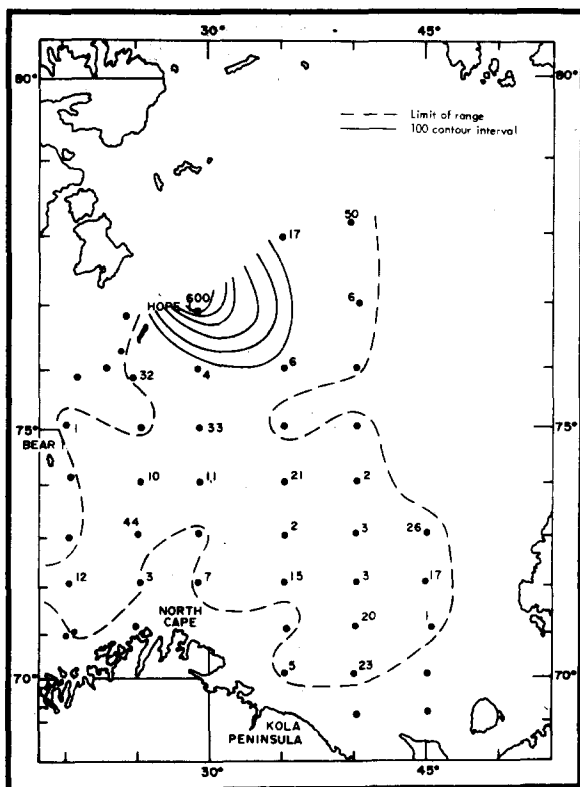


Figure 22. *Paraechasta norvegica*

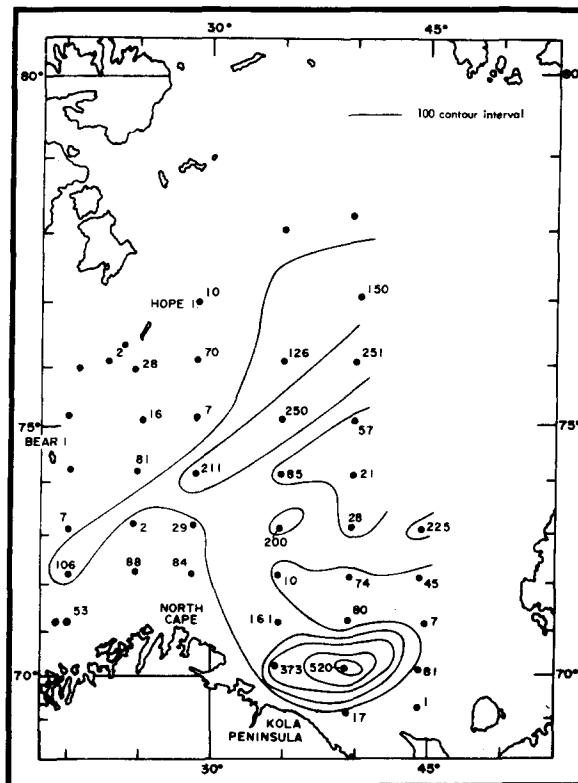


Figure 23. *Calanus hyperboreus*

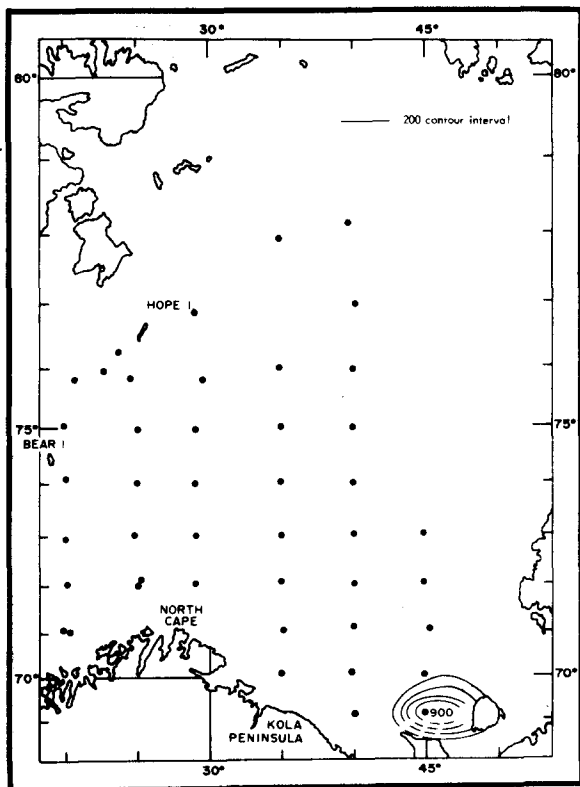


Figure 24. *Temora stylifera*

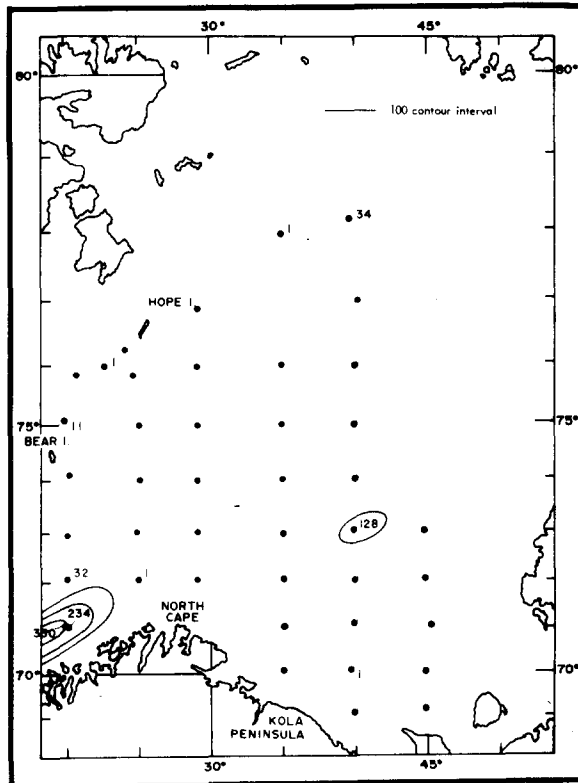


Figure 25. *Microsetella norvegica*

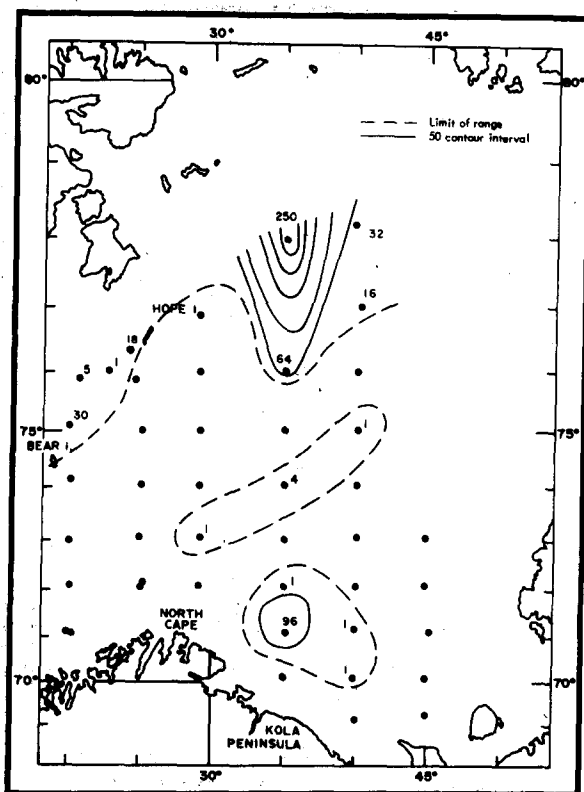


Figure 26. *Tisbe* sp.

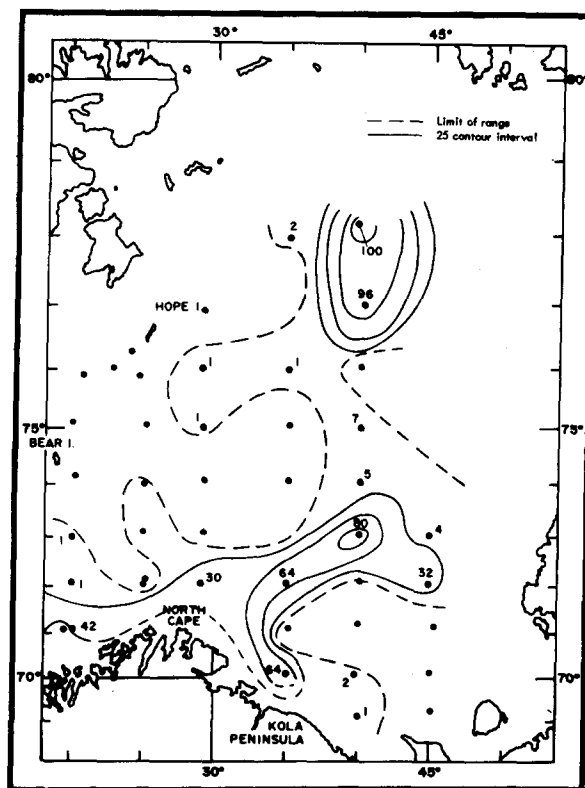


Figure 27. *Scolicithricella minor*

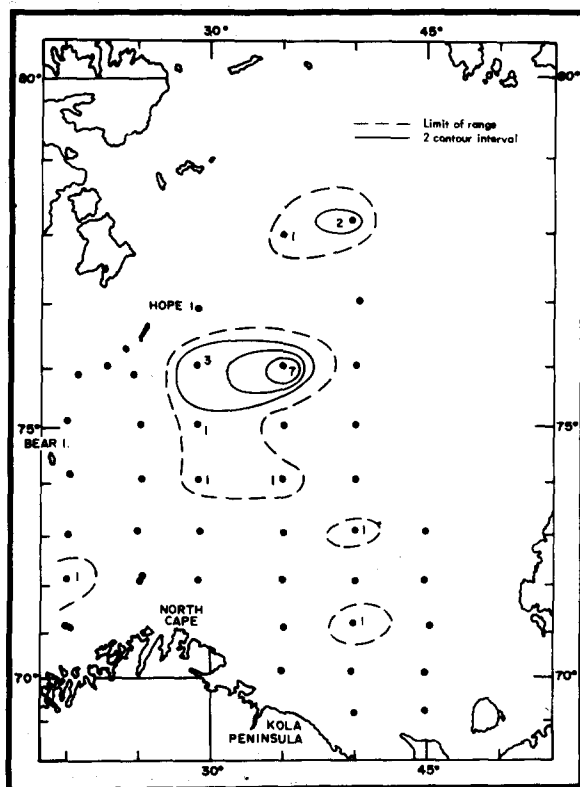


Figure 28. *Gaidius tenuispinus*

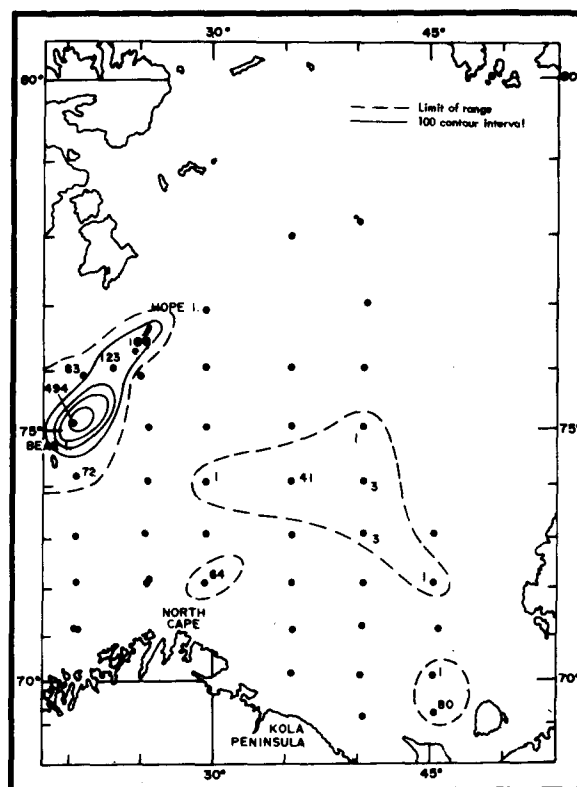
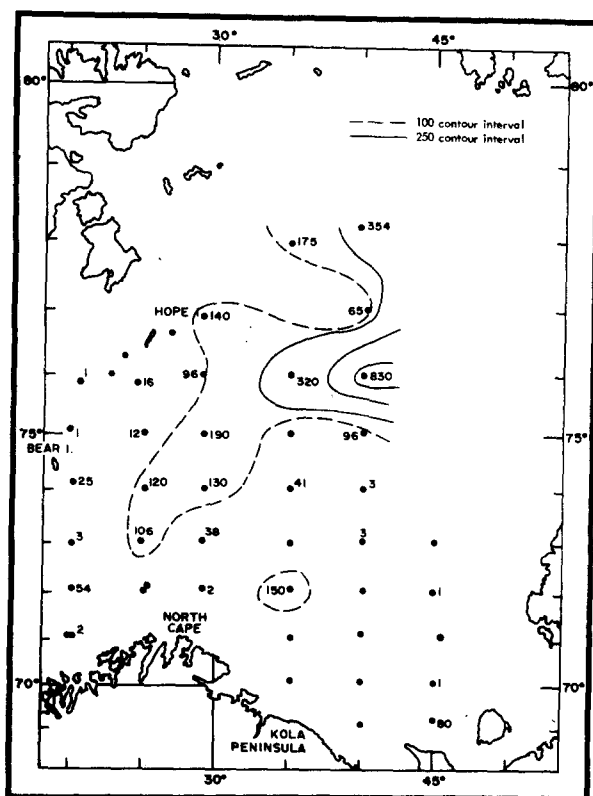


Figure 29. *Balanus* sp. (larvae)



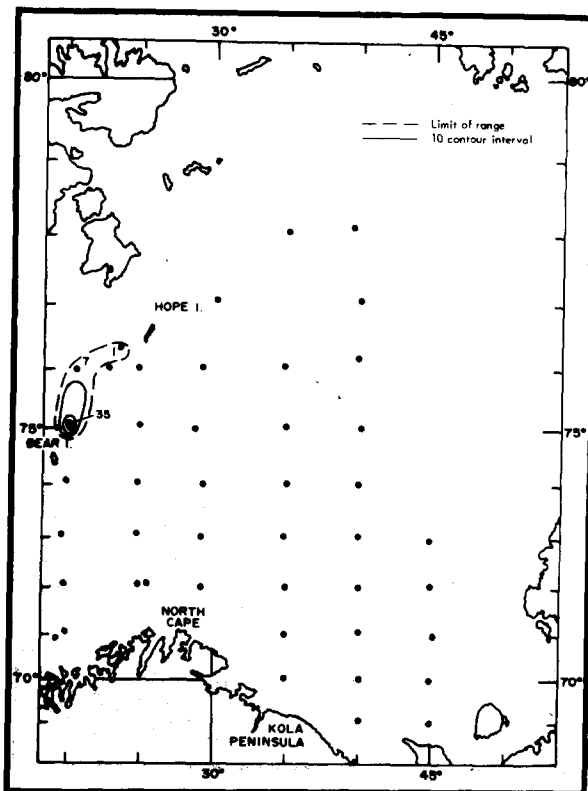


Figure 34. *Copidognathus* spp.

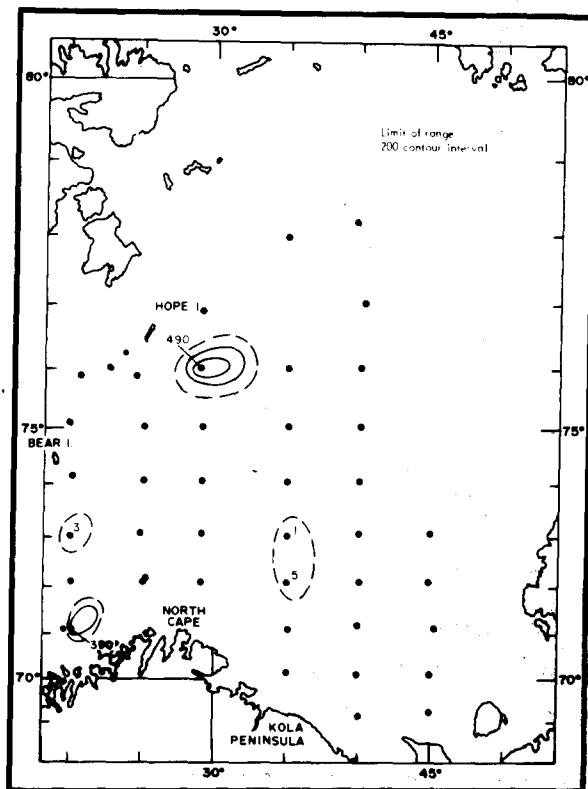


Figure 35. Lamellibranchiata Larvae

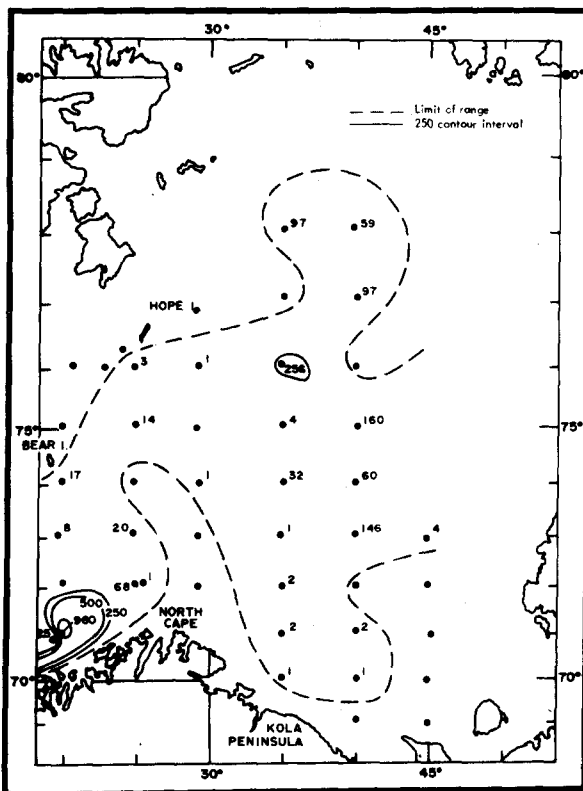


Figure 36. *Clione limacina*

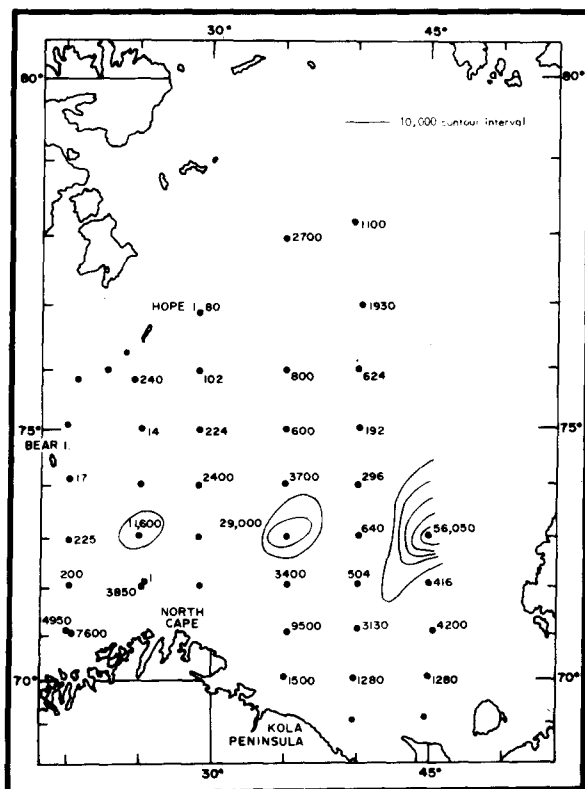


Figure 37. *Limacina* sp.

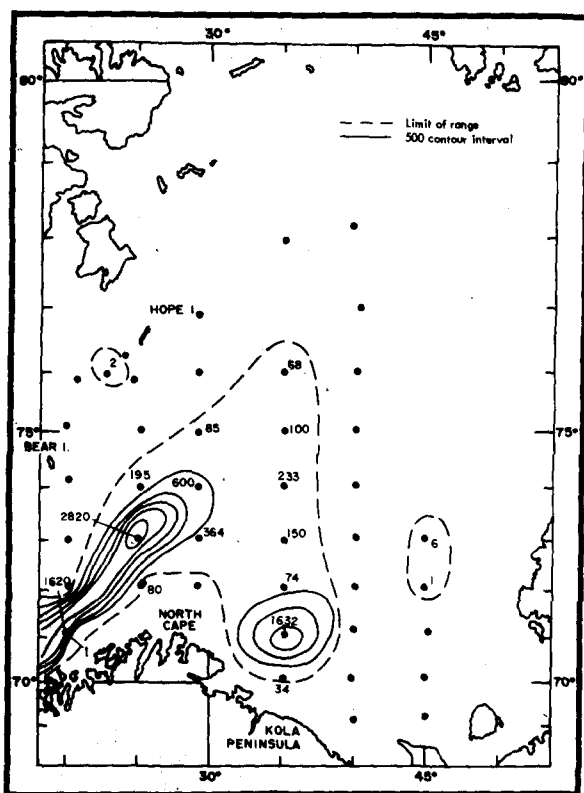


Figure 38. Asteroidea (immature)

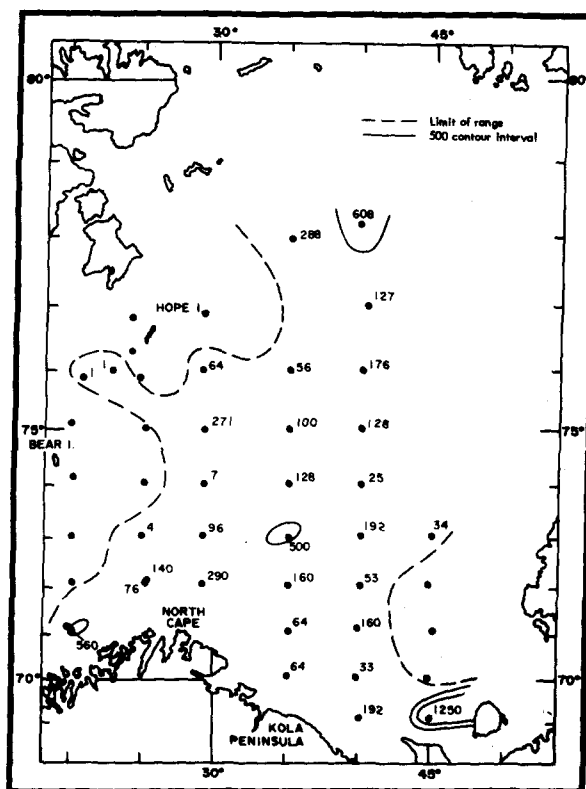


Figure 39. Larvacea

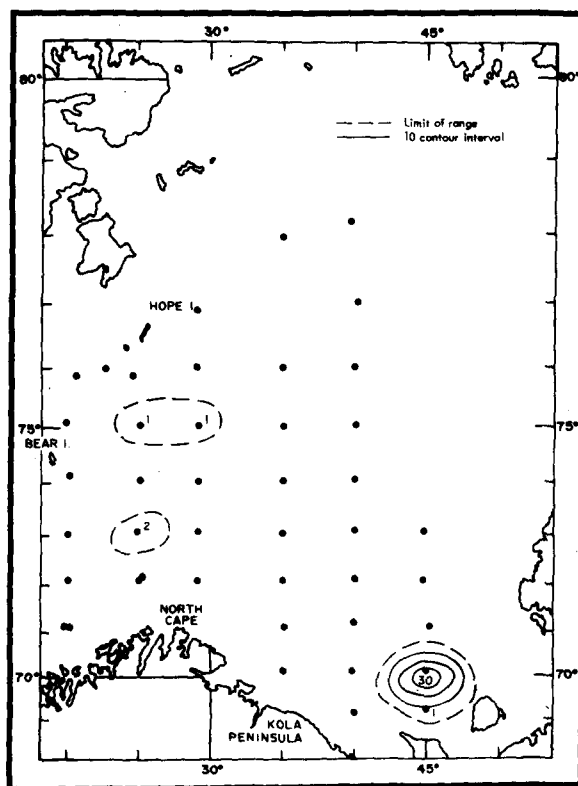


Figure 40. Pisces (immature or larval)

TABLE I. STATION DATA SUMMARY

STA. NO.	DATE 1963	TIME GMT	LAT. (°N)	LONG. (°E)	MESH NO.	MOUTH DIAM.	WATER DEPTH (M)	DEPTH OF TOW (M)	DURATION OF TOW (MINUTES)	WET VOLUME OF PLANKTON (CCS)	T°C TOW DEPTH	S (‰) TOW DEPTH	SECCHI DISC WHITE (M)
1	20 Jul	1800	71°00'	19°54'	10	1/2 m	190	surf	30	14.0	9.23	34.95	18
2	23 Jul	1415	74°04'	20°02'	5	1/2 m	128	surf	30	34.0	2.58	34.18	-
3	23 Jul	1300	75°03'	19°49'	5	1/2 m	37	surf	30	2.5	0.74	33.84	12
4	24 Jul	0200	75°52.5'	20°32'	5	1/2 m	44	surf	30	3.0	1.16	34.10	12
5	25 Jul	1145	76°17.5'	24°02'	5	1/2 m	58	vert (57)	5	1.5	0.02	34.00	18
6	25 Jul	1800	76°00.5'	22°40'	5	1/2 m	64	30	30	2.5	1.03	34.25	-
7	26 Jul	1800	75°00'	25°00'	5	1/2 m	119	78	30	38.0	-1.80	34.76	-
8	28 Jul	1900	74°00'	25°00'	5	1/2 m	444	11	30	150.0	4.85	34.91	-
9	30 Jul	1130	72°03'	25°06'	8	1 ft	258	43	30	5.0	5.73	34.88	11
11	31 Jul	2130	72°00'	29°00'	8	1 ft	284	130	30	20.0	3.92	34.96	-
12	1 Aug	1400	73°00'	29°00'	8	1 ft	298	244	30	5.0	3.00	35.05	12.5
13	2 Aug	0610	74°00'	29°02'	8	1 ft	375	282	30	28.0	1.75	35.06	12
14	2 Aug	2040	75°00'	29°00'	8	1 ft	358	251	30	8.0	1.66	35.05	15.5
15	3 Aug	1530	76°00'	29°00'	8	1 ft	270	231	30	8.0	0.70	34.99	20.5
16	4 Aug	1130	76°54'	29°04'	8	1 ft	252	235	30	15.0	0.93	35.00	20
17	9 Aug	1500	75°52'	24°31'	8	1 ft	101	90	30	17.0	-1.81	34.58	19
18	10 Aug	1045	73°00'	24°46'	8	1 ft	422	159	30	24.0	3.44	35.10	-
19	11 Aug	0720	72°00'	25°00'	8	1 ft	247	200	30	29.0	3.13	35.04	11
20	18 Aug	1730	70°59'	20°02'	8	1 ft	179	160	30	22.0	5.44	35.04	18.5
21	19 Aug	0300	72°00'	20°00'	8	1 ft	307	280	30	20.0	4.78	35.14	13
22	19 Aug	1330	72°56'	19°54'	8	1 ft	417	350	30	5.0	2.65	35.06	10
23	21 Aug	1210	70°00'	35°00'	8	1 ft	243	228	30	44.0	0.78	34.74	14
24	21 Aug	2145	70°59'	35°05'	8	1 ft	174	150	30	45.0	1.31	34.79	dark
25	22 Aug	0730	72°00'	35°00'	8	1 ft	243	165	30	8.0	1.72	34.97	14.5
26	22 Aug	1700	72°58'	35°02'	8	1 ft	221	190	30	20.0	0.42	34.94	-
27	23 Aug	0255	74°00'	35°00'	8	1 ft	291	236	30	15.0	0.20	-	-
28	23 Aug	1300	75°00'	35°00'	8	1 ft	170	145	30	-	-0.24	34.92	25
29	23 Aug	2050	76°00'	35°00'	8	1 ft	203	142	30	20.0	0.63	34.97	-
31	24 Aug	2000	78°00'	35°00'	8	1 ft	174	143	30	14.0	-0.60	34.62	15
32	25 Aug	1030	78°12'	39°42'	8	1 ft	225	115	30	14.0	-0.27	34.62	-
33	26 Aug	0020	77°02'	40°10'	8	1 ft	192	103	30	101.0	-1.07	34.67	19.5
34	26 Aug	1159	76°00'	40°00'	8	1 ft	284	240	30	15.0	-0.88	34.93	20
35	26 Aug	2120	75°00'	40°00'	8	1 ft	182	162	30	18.0	-1.25	34.92	-
36	27 Aug	0710	74°00'	40°00'	8	1 ft	212	192	30	24.0	-0.85	34.92	13.5
37	27 Aug	1650	73°00'	40°00'	8	1 ft	333	160	30	30.0	-1.40	34.88	-
38	28 Aug	0249	72°00'	40°00'	8	1 ft	331	258	30	24.0	-1.07	34.93	-
39	28 Aug	1400	71°03'	39°54'	8	1 ft	271	261	30	15.0	0.01	34.92	17.5
40	29 Aug	0030	69°59'	39°52'	8	1 ft	161	140	30	34.0	0.73	34.78	-
41	29 Aug	0936	69°00'	40°00'	8	1 ft	128	113	44	10.0	2.04	34.60	15
42	29 Aug	2250	69°04'	45°00'	8	1 ft	60	45	30	32.5	2.86	34.28	-
43	30 Aug	0622	69°58'	44°57'	8	1 ft	86	74	37	46.0	0.25	34.69	16
44	30 Aug	1539	71°02'	45°12'	8	1 ft	216	200	30	30.0	-0.04	34.86	-
45	31 Aug	0034	72°01'	44°52'	8	1 ft	234	220	30	17.0	-0.37	34.86	-
46	31 Aug	1035	73°01'	44°49'	8	1 ft	327	210	30	47.0	-1.64	-	10

TABLE II. ESTIMATED NUMBER OF

PLANKTON	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17	18	19	20	21
CHRYSTOPHYTA																				
Rhizosolenia sp. (diatom)								TNTC	TNTC					TNTC					TNTC	TNTC
PROTOZOA																				
Dinoflagellata																				
Ceratium sp.	1,750	25				8				100	32		1	50					380	
Peridinium sp.																			1	
Foraminifera																				
Globigerina sp.			11	TR	3	1					15			1					1	
Radiolaria																				
Naghiopsis sp.								104	1							16	2			
COELENTERATA																				
Siphonophora (nectophores)								47			19	21	228	9	42		12	1		15
Unidentified scyphozoan medusae		1		1			1	23	6	96	5	20	5		56		126	4	186	5
Zoantharia (unidentified species)																				
CTENOPHORA																				
Unidentified species																		1		
PLATYHELMINTHES																				
Turbellaria spp.																				10
BRYOZOA																				
Cyathostoma larvae	6																			
CHAETOGNATHA																				
Eukrohnia hamata		5		2		3	12			32	45	147	10	21			72	27	84	350
Sagitta elegans							53			3	2	2	4	3		36	29		1	
Unidentified immature		85					11	26	9	5	1	39	1	4	40	5	6	1	3	36
ANNELIDA																				
Polychaeta																				
Tanaisia helgolandica												1	2					1	1	1
Unidentified species		25	125	18	11	43	1	10					4			13	FRAG	20	1	517
ARTHROPODA																				
Crustacea (Entomostraca - lower crustaceans)																				
Phyllopoda																				
Evadne sp.																			144	1
Ostracoda																				
Conchocia spp.		25	1	1			12	120		2	38	130	190	96	140	16	106		2	54
Cirripedia larvae (barnacles)		72	494	83	108	123				64		1								
Copepoda																				
Calanus finmarchicus	666	27,000	27	86		690	20,800	266,000	512	7,500	6,750	16,260	5,024	5,540	1,500	9,650	15,000	16,250	14,150	14,600
Calanus hyperboreus						2	16	81		84	29	211	7	70	10	28	2	88	53	106
Calanoida sp.																				
Gaidius tenuis													1	1	3					
Metanephrops norvegicus																				
Meridia longae	50	250				109	500	584	80	4,200	1,920	9,156	4,160	4,960	4,400		1,070	2,880	832	640
Microcalanus pygmaeus	50	25	171			24	632	584	1	3,000	5,024	2,400	450	540	3,600	320	4,640	5,050	1,408	320
Microsetella norvegica	330		11			1													234	32
Oithona similis	15,440	380		4		57	1,250	17,100	48,360	9,730	8,320	2,360	1,090	2,404	150	960	12,300	23,900	770	3,872
Oncaea sp.	6					5	210	970		320	608	1,920	1,020	540	900	64	320	830	32	32
Paraschoenia norvegica								10		7			11	33	4	600	32	44	3	19
Pleuromma robustum																				5
Pseudocalanus minutus	50	150	130			80	400	7,800	220	260	190	260	130	96	230	224	224	256	320	42
Scalithia minor								FEW		30			1	1						1
Tamora stylifera																				
Tibbe sp.			30	5	18	1														
Xanthocalanus borealis	2,700	4,600	15	5			8,500	1,400	16	450	192	32	64	11,500	7,100	5,270	64	1,080	320	
Copepoda nauplii	380																			
Unidentified copepoda																				
Crustacea (Malacostraca - higher crustaceans)																				
Mysidacea																				
Unidentified species																				
Cumacea																				
Leptastylus sp.																				
Euphausiacea																				
All species (see text)	51						4	292	3	160	58	375	24	5		14	760	103	9	54
Amphipoda																				
Parathemisto sp.		1						17		10	17	50	14	7	70	4	14	3		1
Hyperia galba																				
Lysianassa sp.																				
Unidentified species																			6	
Isopoda																				
Idotea sp.							1		2		2		2						1	2
Decapoda																				
Unidentified species		1	1	1		1	2	1		2	1					1		1		1
Arachnoida																				
Acarina																				
Copidognathus spp.			35	7	1															
MOLUSCA																				
Gastropoda																				
Limacina helicina	4,950	390				3	490	5,600	2,180	2,400	3,100	2,400	224	102	80	240	11,600	3,850	7,600	200
Cittina limacina	25	17					14		1			1	16	1		3	20	68	960	
Pelecypoda																				
Lamellibranchiata larvae														490					390	
ECHINODERMATA																				
Asteroida (immature)	1,620	1				2		195			364	600	85				2,820	80	1	
Pluteus larvae						2			140	32										
Invertebrate ova (unidentified)	24																			
CHORDATA																				
Larvacea spp.				1		1			140	290	96	7	271	64			4	76	560	
Pisces (larvae)																				

PLANKTON TAXA AT EACH STATION

22	23	24	25	26	27	28	29	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	TOTAL COUNT	
				50	FEW				300	4					16	40		1			1			412	
85		FEW		1	FEW		TR	TR	3,125	120	16			66	FEW 1			FEW	5,300	FEW		125		11,250 2	
	232					200	25	1,100	20	32	1				48								1	1,410 250 571	
8 1	1	1 1	140 135	21	306 5	FEW 2	372 11	84 1	261 7	145 20	263 17	140 11	11 45	110 82	41 16	154 8		8		85 1	3 5	19	3 3	132 67	2,589 1,085 1
	6					1																		8	
																			2					12	
																							6	12	
	4 13 2	6 23	20 12	31 9	90 16 1	51 62	86 21 4	33 5 2	37 14 10	35 47 15	28 15 5	43 16 3	15 74 4	6 28 3	19 61 21	66 8 3	9 39 11	7	157 7	3 8	26 11	11 11 3	33 98 30	1,439 883 424	
20																									
1	2		1		1 7	50	2 200	136	125	21	FRAG	1 16	2	2	1	32					2	1 2	1 30	17 1,454	
3			150		41 41		320	175	354	65	830	96 1	220 3	50 3	6	7		1		80	1	1	5 1	14	145 276 2,995 1,075
340 7	34,800 373	74,900 161	3,420 10	17,300 200	5,726 85	11,100 250	12,500 126	2,180 96	1,150 55 2	2,240 130	3,850 251	7,450 57	5,370 21	18,820 28	11,800 74	9,570 80	26,050 520	6,140 17	9,320 1 2	93,000 81	27,000 7	8,580 45	65,000 225	885,611 3,687 4 18 4	
95 131	3,400 12,500	832 8,100	3,550 2,080	3,500 2,100	23,600 5,560	800 3,850	28,130 3,100	1,472 2,848	1,500 4,200 34	336 6,050	12,200 2,380	7,550 3,520	7,850 640	11,109 5,500 128	7,300 2,900	9,800 2,620	1,700 3,200	930 1,900	920 520	512 5,880	9,400 6,600	2,200 540	31,700 4,350	206,177 119,308 773	
495 24	19,000 1,310 5	13,400 1,310	13,150 1,930 15	7,650 1,650 2	19,650 5,400 21	19,000 3,550	25,850 10,300 6	7,040 1,500 17	7,650 2,100 50	7,400 540 6	3,210 2,800 6	9,620 5,600 10	6,950 5,000 2	75,380 14,700 3	5,800 5,000 3	21,470 2,650 20	5,200 760 23	10,700 64	3,880 320	13,600	15,500 4,530 1	4,200 2,000 17	62,200 30,500 26	525,672 112,074 1,009 5	
1	2,050 64	2,080	290 64	900	960	6,500	2,560 1	1,210 2	990 100	5,000 96	650	2,240 7	1,280 5	11,800 80	6,030	320	4,800 2	1,180 1	1,280	10,650	4,300	4,700 32	39,400 4	122,190 535 901 521 1	
7	96	290	416	750	250	2,800	3,850	2,050 290	3,040	1,580 90	7,650	9,000	1,320	8,100	96		190 15	25	320		266	190	512	86,106 775	
																								2	
																								6	
3	12	19	2	1	41	3	16		7	75	FEW	7		38	10	65	15	4	4			3	14	2,260	
1	1	6		5	1	1	30	12	39 4 1	31 1 6	5			90	26	20	4		8	7		7	41	542 6 28 44	
					1		1		1				4	22					6					22 17	
							1		2					1	6	1					1			43	
225 8	1,500 1	9,500 2	3,400 2	29,000 1	3,700 32	600 4	800 256	2,700 97	1,100 59	1,930 47	624	192 160	256 60	640 146	584	3,130 2	1,280 1			1,280	4,200	416	56,050 4	113,950 2,000	
3			5	1																				889	
	34	1,632	74	150	233	100	68 176	56				1	1									1	6	8,065 410	
							736			120												64	994	1,938	
	64	64	160	500	128	100	56	288	608	127	176	128	25	192	53	160	33	192	1250 1		30		34	5,848 35	

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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13. ABSTRACT			
<p>A total of 44 plankton samples was collected in the Barents Sea during a 1963 NAVOCEANO survey aboard USS TANNER (AGS 15). At least three groups of well-defined plankton associations in the Barents Sea are indicated from analysis of the samples. The three assemblages consist of the following:</p> <ol style="list-style-type: none">(1) A permanent resident assemblage in the central portion of the sea.(2) Species from Atlantic origins that were carried into the sea by the North Cape Current.(3) Species from Arctic origins that were carried into the sea by the East Spitzbergen and Bear Island Currents. <p>A new species of benthic mite, genus <u>Copidognathus</u>, was discovered in the Barents Sea plankton samples. The name <u>Copidognathus spenceri</u> will be submitted for this species.</p>			

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KEY WORDS

PLANKTON
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COPIDOGNATHUS SPENCERI

LINK A

LINK B

LINK C

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